33.73
3kas
988

State Library Copy

THIS DOCUMENT
BELONGS TO THE DSL
AMR LIBRARY

SUMMARY

KLEIN AIR SHAFT CONCRETE CAP
STATEWIDE MAINTENANCE
MUSSELSHELL COUNTY, MONTANA

AUGUST 1988

STATE DOCUMENTS COLLECTION

JUN 0 6 2003

MONTANA STATE LIBRARY
1515 E. 6th AVE.
HELENA, MONTANA [illegible]

SPECTRUM ENGINEERING

MINING & CIVIL ENGINEERS

MONTANA STATE LIBRARY
3 0864 1002 0561 9

[redacted]

~~NRIS 40031~~

SUMMARY

KLEIN AIR SHAFT CONCRETE CAP
STATEWIDE MAINTENANCE
MUSSELSHELL COUNTY, MONTANA

AUGUST 1988

Prepared for:

MR. RICHARD JUNTUNEN, CHIEF
Abandoned Mine Reclamation Bureau
Department of State Lands
1625 11th Avenue
Helena, Montana 59620

Prepared by:

SPECTRUM ENGINEERING
Mining & Civil Engineers
3302 Fourth Avenue North
Billings, Montana 59101

Gary Rome, P.E. Project Engineer	Gary Rome, P.E. Project Inspector

KLEIN STATEWIDE MAINTENANCE SUMMARY

I. INTRODUCTION

A. Project Objectives

The reclamation work was undertaken under the statewide maintenance program to restore an area previously addressed under the AML program (First in 1981 and again as Klein II Revegetation - 4/11/84). Per a letter (11/27/87) from Ben Mundie of State Lands to Spectrum Engineering, a reopened shaft was to be backfilled and a concrete cap placed over the backfill.

B. Site Description and Location

The KLEIN shaft (Republic or Klein Mine No. 2) is located 2.5 miles south of Roundup, Montana in the NE 1/4 NW 1/4 SE 1/4 of Section 36, Township 8 North, Range 25 East. Refer to the Site and Vicinity Maps for location.

C. Land Ownership and Access

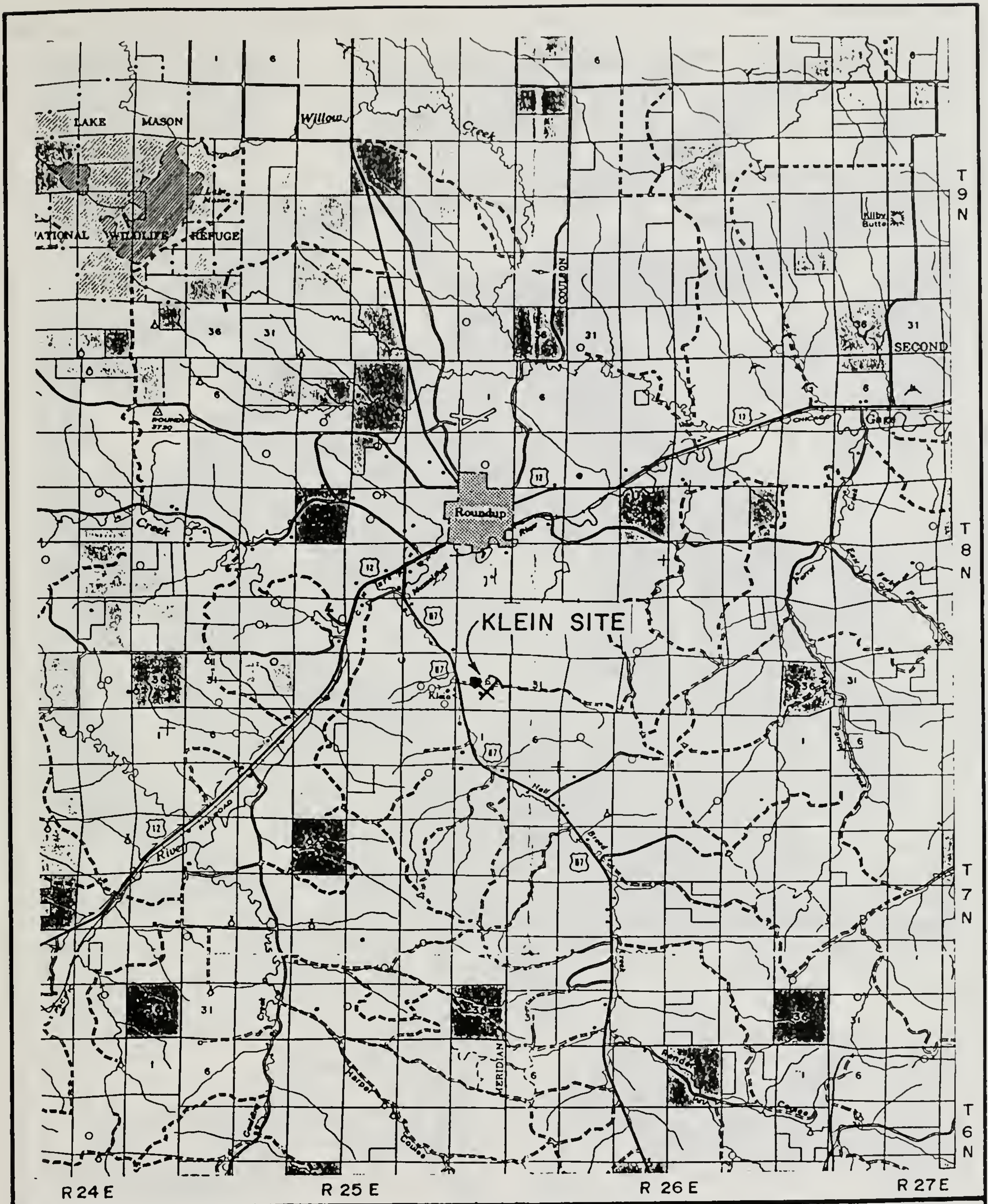
The site is owned by Merrill Armstrong, 15 Mineral Drive, Roundup, Montana 59072 at phone (406) 323-1464 or 323-1613.

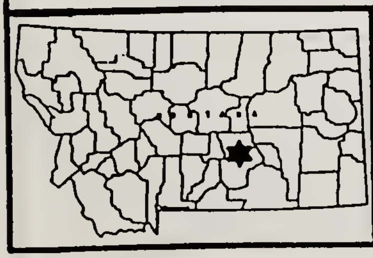
D. History

The Klein Mine is an abandoned underground coal mine located in the Bull Mountain Coal Field near Roundup, Montana. The mine opened in 1909 and was in operation until 1956. A town, also named Klein, was established in 1909 a short distance from the mine. Twenty structures and 31 features remained at the mine in 1981 when a historical survey was performed for the Department of State Lands by Historical Research Associates. See the accompanying map of the site (24ML143). A total of 573,000 tons were produced from this mine over its life span.

Feature 3 on the map is the shaft addressed in this report. This was a walk-down shaft, used as an escape shaft in case of a cave-in or power failure. It was 347 feet deep and had metal stairs, ten in a stretch between landings, leading to the underground workings. In 1957 the shaft was deliberately caved-in to avoid accidents.

This shaft was again backfilled in 1981 as part of the AML program. During the fall of 1987 this shaft again subsided. The decision was made to not only backfill but to concrete cap the shaft this time around.





STATE OF MONTANA — DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU—RECLAMATION DIVISION

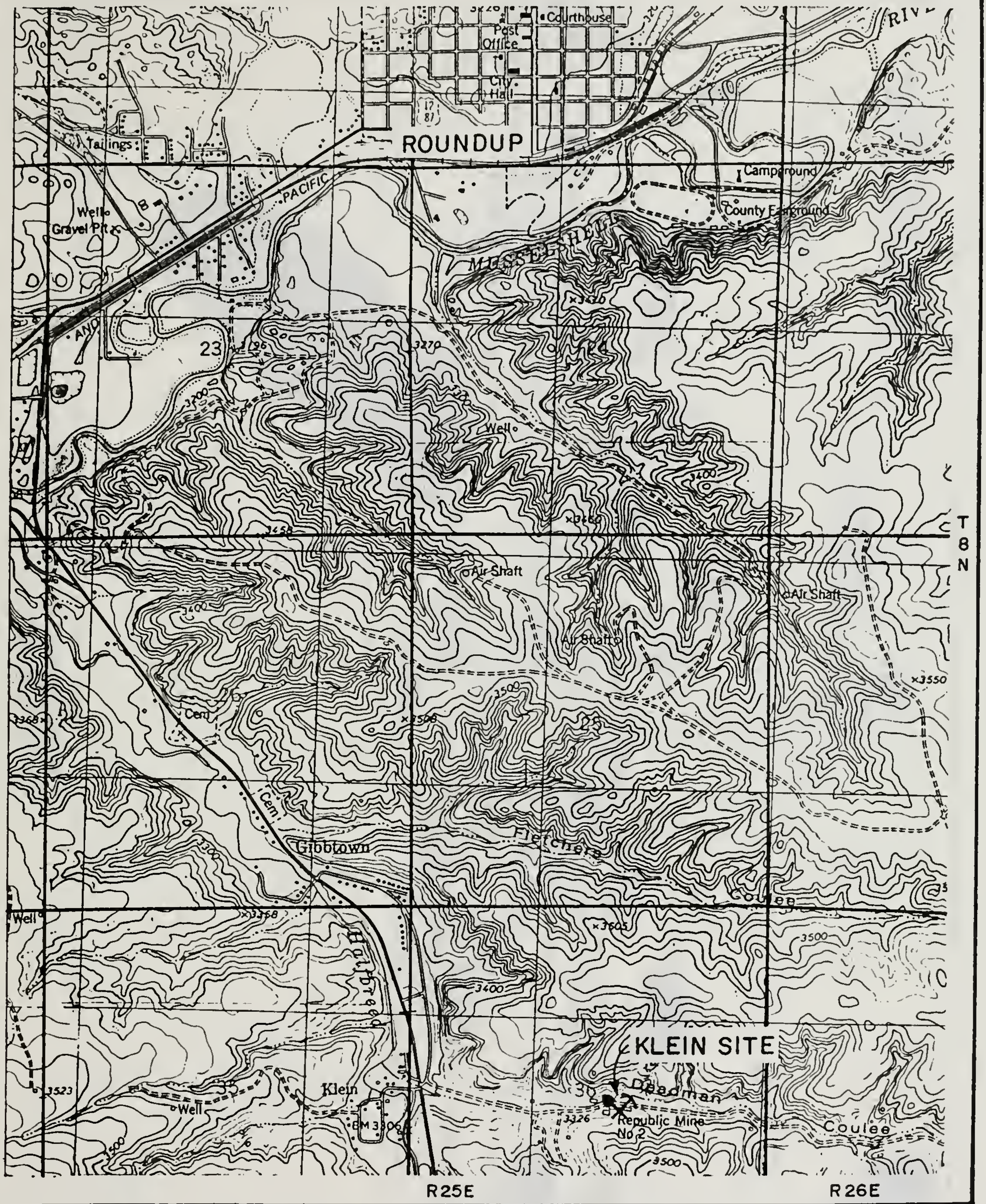
VICINITY MAP

SITE KLEIN STATEWIDE MAINTENANCE

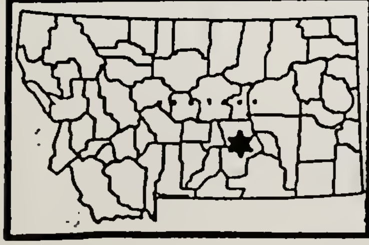
MUSSELSHELL COUNTY, MT; TOWNSHIP 8N RANGE 25E

SECTION(S) 36

MAP SCALE: 1" = 2.5 Miles



STATE OF MONTANA — DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU—RECLAMATION DIVISION



SITE MAP

SITE KLEIN - STATEWIDE MAINTENANCE

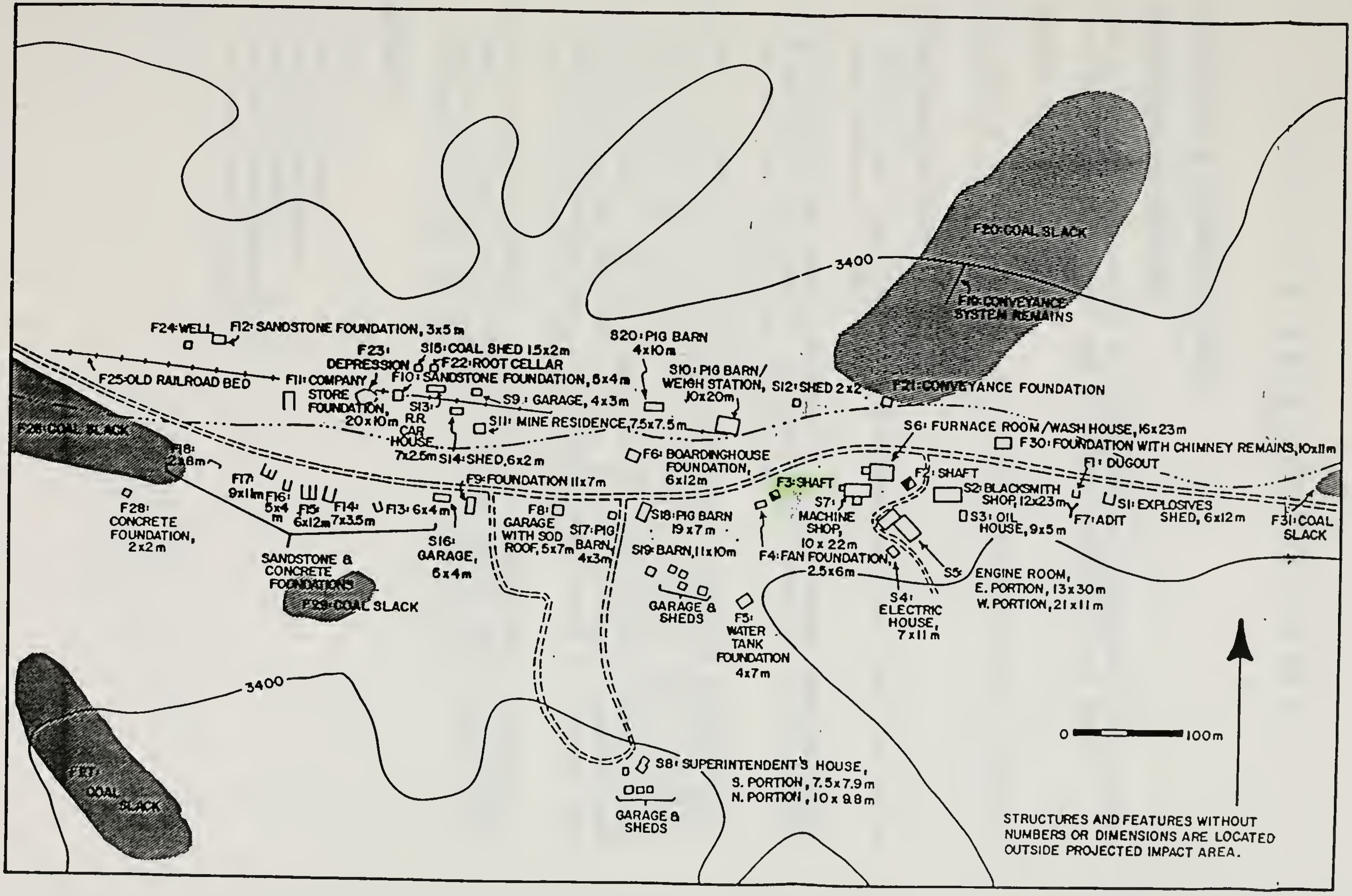
MUSSELSHELL COUNTY, MT; TOWNSHIP 8N RANGE 25E

SECTION(S) 36

MAP SCALE: 1" = 2000' U.S.G.S. QUAD SHEET ROUNDUP

N

MAP OF 24ML143
(KLEIN MINE)


F20: COAL SLACK
3400
F19: CONVEYANCE SYSTEM REMAINS
F24: WELL
F12: SANDSTONE FOUNDATION, 3x5 m
F23: DEPRESSION
S15: COAL SHED 1.5x2m
F22: ROOT CELLAR
F25: OLD RAILROAD BED
F11: COMPANY STORE FOUNDATION, 20x10m
F10: SANDSTONE FOUNDATION, 6x4m
S9: GARAGE, 4x3m
S13: R.R. CAR HOUSE 7x2.5m
S11: MINE RESIDENCE, 7.5x7.5m
S14: SHED, 6x2 m
S20: PIG BARN 4x10m
S10: PIG BARN/ WEIGH STATION, 10x20m
S12: SHED 2x2
F21: CONVEYANCE FOUNDATION
S6: FURNACE ROOM/WASH HOUSE, 16x23m
F30: FOUNDATION WITH CHIMNEY REMAINS, 10x11m
F1: DUGOUT
F26: COAL SLACK
F18: 2x8m
F17: 9x11m
F16: 5x4 m
F15: 6x12m
F14: 7x3.5m
F13: 6x4m
F9: FOUNDATION 11x7m
F6: BOARDINGHOUSE FOUNDATION, 6x12m
F3: SHAFT
F2: SHAFT
S2: BLACKSMITH SHOP, 12x23m
S1: EXPLOSIVES SHED, 6x12m
F31: COAL SLACK
F28: CONCRETE FOUNDATION, 2x2m
SANDSTONE & CONCRETE FOUNDATIONS
F29: COAL SLACK
S16: GARAGE, 6x4m
F8: GARAGE WITH SOD ROOF, 5x7m
S17: PIG BARN 4x3m
S18: PIG BARN 19x7m
S19: BARN, 11x10m
GARAGE & SHEDS
F5: WATER TANK FOUNDATION 4x7m
S7: MACHINE SHOP, 10x22m
F4: FAN FOUNDATION, 2.5x6m
S4: ELECTRIC HOUSE, 7x11m
S5: ENGINE ROOM, E. PORTION, 13x30m W. PORTION, 21x11m
S3: OIL HOUSE, 9x5m
F7: ADIT
3400
F27: COAL SLACK
S8: SUPERINTENDENT'S HOUSE, S. PORTION, 7.5x7.9m N. PORTION, 10x9.8m
GARAGE & SHEDS
0
100m

STRUCTURES AND FEATURES WITHOUT NUMBERS OR DIMENSIONS ARE LOCATED OUTSIDE PROJECTED IMPACT AREA.

II. DESCRIPTION OF RECLAMATION PROJECT

A. Site Hazards and Problems

The KLEIN site consists of an concrete-lined shaft which had subsided and left an opening 12 feet wide by 14 feet long by 15 feet deep.

B. Project Planning

The scope of work at this site was to backfill the shaft and construct a concrete cap over the compacted fill.

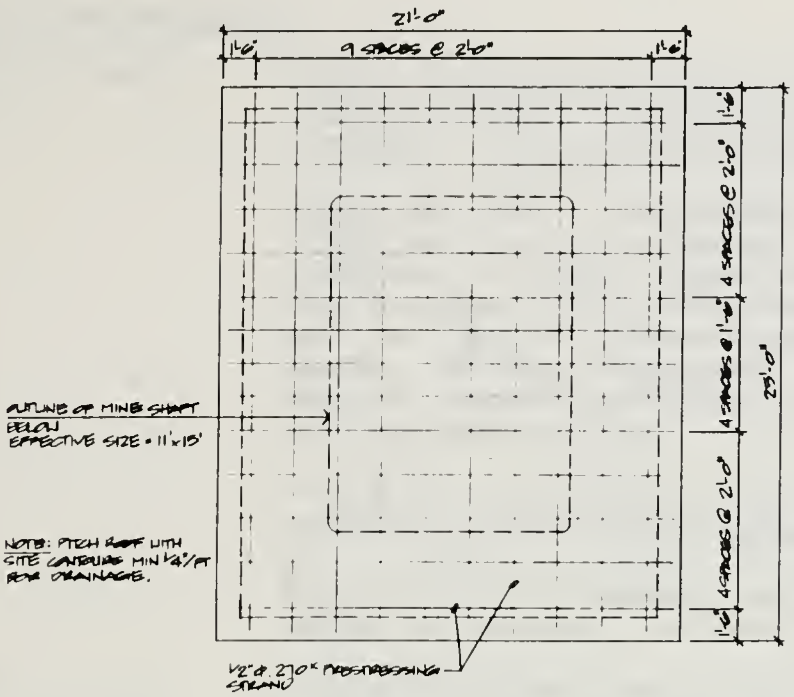
C. Chronological History

1. The work was requested by the Department of State Lands per letter dated November 27, 1987.
2. A site visit was made on December 11, 1987. Present were Ben Mundie from State Lands, Merrill Armstrong - the landowner, and Bill Maehl and Gary Rome from Spectrum Engineering.
3. Quality Concrete in Billings was contacted regarding completing the work. Bids were received back on December 16, 1987 of $ 11,900 for a post-tension cap or $ 15,773 for a pre-cast concrete cap. The post-tension cap was chosen and the proposal approved. The $ 11,900 included backfilling and compacting the subsided mine shaft, forming and placing the concrete, casting 9 test cylinders, covering and heating the concrete cap. The tension cables would be stressed when sufficient strength was obtained in the cap.
4. Work started on December 17, 1987 and proceeded until December 22, 1987. It then took slightly over one month until the concrete reached sufficient strength to place the cap into post-tension which was done on January 28, 1988.

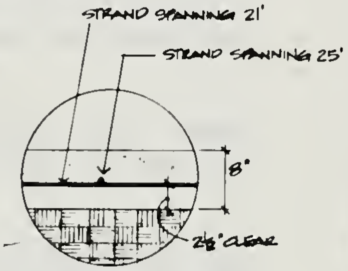
D. Equipment

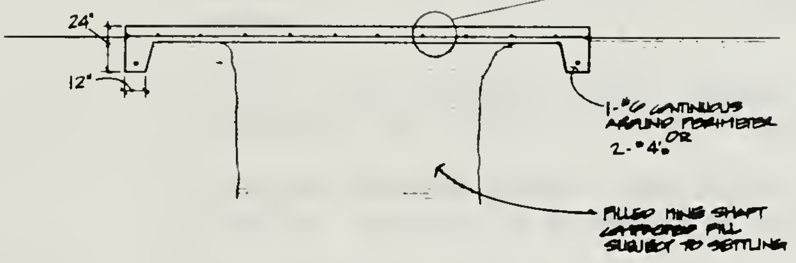
1. Bobcat 743;
2. Case 580C Loader;
3. Single-footed Wacker;
4. Concrete Trucks;
5. Concrete Forming Materials;
6. Post-tensioning Equipment.

FIELD CHANGED TO 22' ON 12/18/88



PLAN




24"
12"
1-#6 CONTINUOUS AROUND PERIMETER OR 2-#4's
FILLED MINE SHAFT COMPACTED FILL SUBJECT TO SETTLING

SECTION

MINE SHAFT CAP

SCALE : 1/4" = 1'-0"

GENERAL NOTES:

CONCRETE.

1. MINIMUM 7 SACKS / C.Y.
2. MIN. 28 DAY COMPRESSIVE STRENGTH = 5000 PSI
3. TYPE I-II
4. 6% A.E.A.
5. 4" MAX. SLUMP
6. NO CALCIUM CHLORHIDE

PRESTRESSING STRAND

1. ASTM A416, 270K, UNCOATED, 7 WIRE, STRESS RELIEVED, LOW RELAXATION, GREASED & SLEEVED.
2. MINIMUM DIAMETER = 1/2"
3. MINIMUM INITIAL TENSION = 28,900# @ 70%
4. MINIMUM FINAL TENSION = 23,000#

E. Daily Construction Log

Dec. 17, 1987

- Dropped 15 concrete pieces (up to approximately 3 cubic yard each) into shaft and adjusted their positions, as appropriate with backhoe.
- Backfilled shaft to approximately road level with Bobcat and Case loader/backhoe. After shaft was accessible, a single footed tamper (wacker) was used to compact fill. Fill material is very good, but too dry to obtain excellent compaction. However, the results are good. Bobcat and wacker used to compact approximately 120 cubic yards including concrete pieces.
- Area from where concrete pieces were removed was smoothed to uniform contours using backhoe.
- Rim of shaft was prepared. Concrete and earth was removed, as necessary, for leveling.

Dec. 18, 1987

- Adjusted slab plans from 21 x 25 to 22 x 25. Forms were set with 3" of fall from the hill to the road built into the slab.
- Final grading of the earthwork with the Bobcat and the Wacker. The borrow area was regraded with the backhoe.
- Forms were finished and holes drilled to accommodate the strands 3.5" down from the top.
- Area covered with plastic and blankets to prevent freezing. Concrete to be poured on the 22nd.

Dec. 22, 1987

- Post stressing cables were placed and adjusted to give them a parabolic catenary shape. This was more difficult than initially thought; however, we were satisfied with the results. The north-south strands (22') were placed beneath the east-west strands (25'). Also two #4 bars were placed on the circumferential footing of the slab.
- Concrete was poured and long-floated. Samples were taken. Electrical power was extended to the site and tested. Initial meter reading was 2545 KwHr.

E. Daily Construction Log

Dec. 22, 1987 (Cont.)	-	Due to the cool temperature, the concrete did not cure very fast. The decision was made to cover the concrete for overnight and a tent would be built on the 23rd. Blankets plus heat of hydration will prevent freezing.
	-	A total of 13 - 22 foot strands were used and 10 - 25 foot strands and about 16 cubic yards of concrete (7.5 bag mix) with no calcium added was poured. Nine test cylinders were cast. A total of 94 feet of #4 rebar was used.
Dec. 23, 1987	-	Rolled back blankets and observed that the concrete was not frozen. Built a tent over the concrete with barricades, plywood sheets, 2 x 4's, and plastic sheets. A 200 watt heater with fan was placed inside. Project was put on hold until the concrete reached sufficient strength to place the strands into tension.
Jan. 15, 1988	-	The tent protecting the slab during curing was removed.
Jan. 28, 1988	-	Removed plastic collars in preparing for post stressing.
	-	Post-tensioned the strands. None broke, came loose, or otherwise malfunctioned. The holes left from the post-tension operations were grouted.
	-	Final earthwork grading was finished.

III SLIDES

The description of the slides taken to document the work performed at this site is found in Appendix A. In addition, the original slides are found at the very back of one volume and black and white copies of the slides are found in all three volumes directly behind the slide descriptions in Appendix A.

IV. COST SUMMARY

This statewide maintenance project was completed by Quality Concrete out of Billings for a fixed price of $ 11,900.

V. SUMMARY

A. Completed Reclamation

The Contractor completed the work in five days on-site over a five-week period.

B. Comments/Recommendations

All construction work at this site was completed by the Contractor as specified. Some of the concrete blocks littering the site was used for fill material. This procedure helped clean up the site and reduce the quantity of fill necessary.

In the future, if at all possible, it would be better to wait for better weather to attempt this type of project. By starting in late December and completing in late January, you assure that you will have some bad weather along the way. It cost the Contractor $ 91.00 (paid to the landowner) to keep the concrete heated under the constructed tent over the pad.

No unusual situations happened on this job. It checking prices prior to starting construction, it was considerably cheaper to use post-stressing for the concrete pad as opposed to a pre-cast pad. Based on Highway bridge decking around Billings, it appears that stressing will outlast pre-casting.

APPENDIX A

SLIDE DESCRIPTIONS

KLEIN STATEWIDE MAINTENANCE SUMMARY

ASSIGNED NUMBER	DATE TAKEN	SLIDE NUMBER	SUBJECT OR COMMENTS
1	12-17-87	1	Shaft prior to any work; looking from the North.
2	12-17-87	2	Shaft prior to any work; looking from the North.
3	12-17-87	3	Shaft and borrow area in background; looking from South.
4	12-17-87	4	Placing large concrete blocks into shaft.
5	12-17-87	5	Placing large concrete blocks into shaft.
6	12-17-87	6	Shaft with fence panels removed - road in foreground.
7	12-17-87	7	Shaft with fence panels removed - road in foreground.
8	12-17-87	8	Concrete pieces going into shaft.
9	12-17-87	9	View of concrete pieces in the shaft.
10	12-17-87	10	Moving of larger concrete pieces.
11	12-17-87	11	Moving of larger concrete pieces.
12	12-17-87	12	Backfilling shaft - note borrow area in background.
13	12-17-87	13	Backfilling; loader, shovel and tamper present.
14	12-17-87	14	Compaction with single-footed tamper.
15	12-17-87	15	Placing backfill with loader followed by compaction.
16	12-17-87	16	Smoothing the area where concrete pieces were.
17	12-17-87	17	Borrow area excavation.
18	12-17-87	18	Restoring borrow area contours.
19	12-17-87	19	Shaft backfilled - flags mark shaft corners.

KLEIN STATEWIDE MAINTENANCE SUMMARY

ASSIGNED NUMBER	DATE TAKEN	SLIDE NUMBER	SUBJECT OR COMMENTS
20	12-17-87	20	Concrete forms "stringed" and started.
21	12-17-87	21	Backfilling to final grade.
22	12-17-87	22	Backfilling to final grade.
23	12-17-87	23	Backfilling to final grade.
24	12-17-87	24	Forms set - grade to finish.
25	12-22-87	1	Preparing to pour; uncovering grade.
26	12-22-87	2	Placing post-stress strands - one direction.
27	12-22-87	3	Placing post-stress strands - other direction.
28	12-22-87	4	Strands on chairs to achieve proper shape.
29	12-22-87	5	Starting to place concrete.
30	12-22-87	6	Vibrator used to eliminate voids.
31	12-22-87	7	Placing and vibrating concrete.
32	12-22-87	8	Shows details of post-stress strand hardware.
33	12-22-87	9	Attaining elevation with mix.
34	12-22-87	10	Vibrating on close interval.
35	12-22-87	11	Smoothing first load; beginning second load.
36	12-22-87	12	Continuing pour.
37	12-22-87	13	Preparing test cylinders - some each load.
38	12-22-87	14	Test cylinders at various stages.
39	12-22-87	15	Placing complete - floating continues.
40	12-22-87	16	Slab after it is broom-finished.
41	12-22-87	17	Concrete covered overnight to preserve heat.

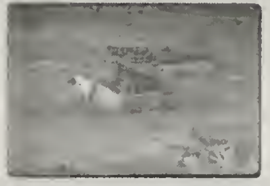
KLEIN STATEWIDE MAINTENANCE SUMMARY

ASSIGNED NUMBER	DATE TAKEN	SLIDE NUMBER	SUBJECT OR COMMENTS
42	12-22-87	18	Tent construction over slab.
43	12-22-87	19	Looking under barricades to heater.
44	12-22-87	20	Spreading plastic sheets over tent frame.
45	12-22-87	21	Power leading to fan within tent.
46	12-22-87	22	Finished tent.
47	1-28-88	1	Slab with post-tension strands exposed.
48	1-28-88	2	Slab with post-tension strands exposed.
49	1-28-88	3	Post-tension apparatus.
50	1-28-88	4	Strand with sleeve and socket close-up.
51	1-28-88	5	Post-tension of the first strand.
52	1-28-88	6	Control panel of post-tension apparatus.
53	1-28-88	7	Stretching the strand; note length difference in strands.
54	1-28-88	8	Measuring the amount of strand stretch.
55	1-28-88	9	View of strand wedge assembly.
56	1-28-88	10	Apparatus secured & oxy-acetylene torch out for cutting.
57	1-28-88	11	Cutting stands after post-tensioning.
58	1-28-88	12	Cutting strands inside the socket.
59	1-28-88	13	Cutting strands inside socket.
60	1-28-88	14	View inside socket after strand is cut.
61	1-28-88	15	Grouting the sockets.
62	1-28-88	16	All holes grouted.
63	1-28-88	17	Final earthwork commences.
64	1-28-88	18	View from North of the covered shaft.

KLEIN STATEWIDE MAINTENANCE SUMMARY

ASSIGNED NUMBER	DATE TAKEN	SLIDE NUMBER	SUBJECT OR COMMENTS
65	1-28-88	19	View from North of the covered shaft.
66	1-28-88	20	Final smoothing with rake.
67	1-28-88	21	Final smoothing with rake.
68	1-28-88	22	Final smoothing.
69	1-28-88	23	Final debriefing.

shaft prior to any work looking from the North



① 12/17/87

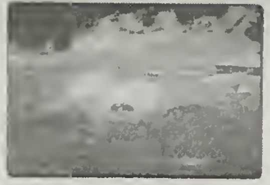
1

shaft prior to any work; looking from the North

② 12/17/87

2

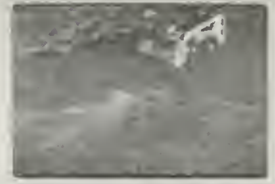
shaft + borrow area in background, looking from South



③ 12/17/87

3

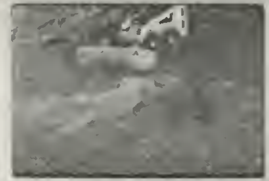
placing large concrete blocks into shaft.



④ 12/17/87

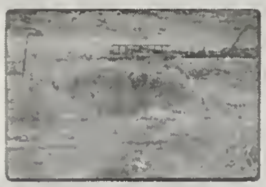
4

Placing large concre blocks in to shaft



⑤ 12/17/87

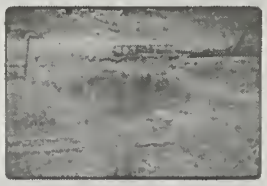
shaft with panels moved-road in foreground



12/17/87

6

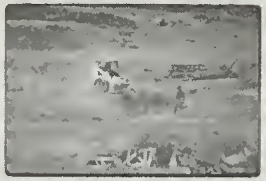
shaft with panels removed-road in foreground



⑦ 12/17/87

7

Concrete pieces going in the shaft



⑧ 12/17/87

8

View of Concrete pie in the shaft

⑨ 12/17/87

9

moving of larger concrete pieces.

⑩ 12/17/87

moving of larger concrete pieces.

⑪ 12/17/87

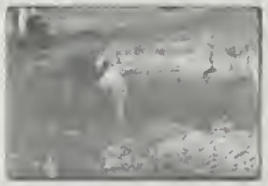
11

backfilling shaft note borrow area in background

⑫ 10/17/87

12

backfilling; loader, shovel and tamper present



⑬ 12/17/87

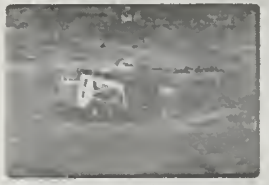
13

Compaction with single footed tamper

⑭ 12/17/87

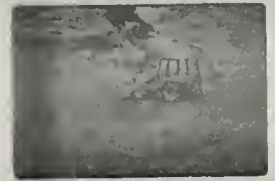
14

placing with loader. followed by compaction



⑮ 12/17/87

Smoothing the area where concrete pieces were



⑯ 12/17/87

Borrow area excavation

⑰ 12/17/87

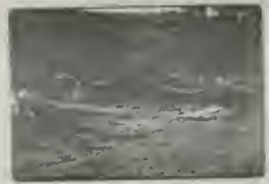
Restoring borrow Area Contours

⑱ 12/17/87

Shaft backfilled flags mark shaft corners

⑲ 12/17/87

forms "stringed" an started



⑳ 12/17/87

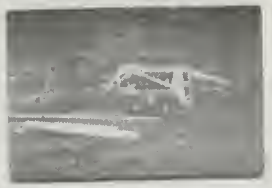
backfilling to final grade

㉑ 12/17/87

backfilling to final grade

㉒ 12/17/87

backfilling to final grade



㉓ 12/17/87

forms set - grade to finish

24 12/17/87

preparing to pour; uncovering grade

㉕ 12/22/87

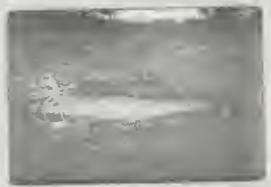
placing post-stress strands one direction

㉖ 12/22/87

placing post-stress strands -other direction

㉗ 12/22/87

strands on chairs to achieve proper shape



㉘ 12/22/87

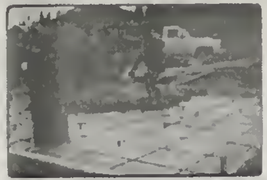
starting to place concrete.

㉙ 12/22/87

vibrator used to eliminate voids

㉚ 12/22/87

placing + vibrating
concrete



3 12/22/87 7

shows details of
post-stress strand
hardware

32 12/22/87 8

attaining elevation
with mix

33 12/22/87 9

vibrating on close
interval

34 12/22/87 10

smoothing first loa
beginning second loa

35 12/22/

continuing pour

3 12/22/87

preparing test cylinders
same each load

37 12/22/87 13

test cylinders at
various stages

38 12/22/87 14

placing complete -
floating continues

39 12/22/87 15

slab broom-
-finished

40 12/22/87

ncrete covered
ernight to preserve
heat

41 12/22/87 17

tent construction
over slab

42 12/22/87 18

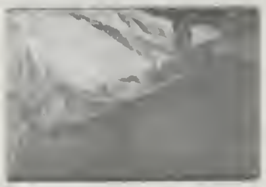
looking under barricade
to heater

43 12/22/87 19

spreading plastic
sheets over tent
frame.

44 12/22/87

power leading to f
within tent



45 12/22/87

finished tent

(46) 12/22/87

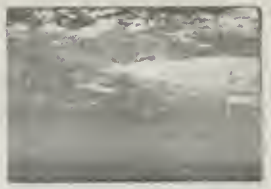
Slab with post tension strands exposed

(47) 1/28/88

Slab with post-Tension strands exposed

(48) 1/28/88

Post-tension aparat

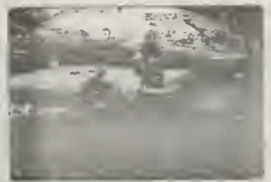


(49) 1/28/88

strand with sleeve and socket close up

(50) 1/28/8

post-tension of the first strand



(51) 1/28/88

control panel of post tension apparatus

(52) 1/28/88

stretching the strand, note length difference in strands

(53) 1/28/88

measuring the amount of strand stretch

(54) 1/28/88

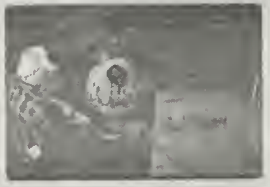
view of strand wed assembly

(55) 1/28/88

apparatus secured + oxy-acetylene torch out for cutting

(56) 1/28/88

cutting strands after post-tensioning



(57) 1/28/88

Cutting strands inside the socket

(58) 1/28/88

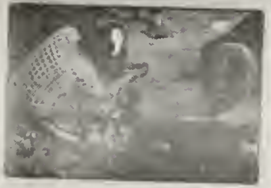
cutting strands insid the socket

(59) 1/28/88

View inside socke after strand is cu

(60) 1/28/8

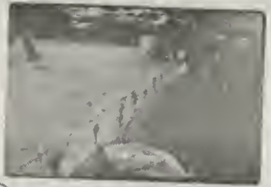
grouting the sockets



(61) 1/28/88

15

all holes grouted



(62) 1/28/88

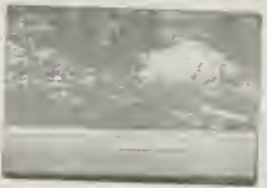
16

final earthwork commences

(63) 1/28/88

17

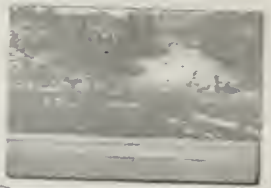
view from North of the covered shaft



(64) 1/28/88

18

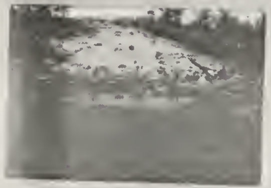
view from North of the covered shaft



(65) 1/28/88

19

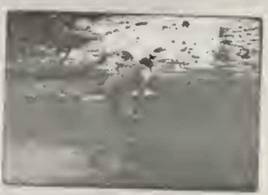
final smoothing with rake



(66) 1/28/88

20

FINAL smoothing with rake



(67) 1/28/88

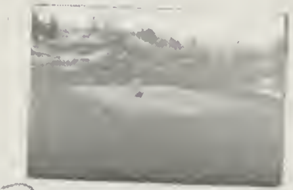
21

final smoothing

(68) 1/28/88

22

final debriefing



(69) 1/28/88

23

APPENDIX B

MATERIALS TEST RESULTS

HKM ASSOCIATES
SUMMARY OF CONCRETE
TEST DATA

PROJECT NAME: Quality Concrete - 1988 Materials Testing
PROJECT NO: 11C146.102
Document NO: WPLAB37

REPORT DATE: Various
CONTRACTOR: Quality Concrete
SUPPLIER: Quality Concrete

Cylinder No.	Rpt No.	Dates			Sample Location and Structure	Mix No.	Test Results			
		Cast	Recvd	Tested			Slump in.	Air %	Load PSI	Age days
5500A	1	12/22/87	12/30/87	12/31/87	Kline Montana Mine Reclamation - Tunnel Entrance (Field #22)	4000 psi	3	N/T	3220	9
5500B				12/31/87					3360	9
5500C				01/04/88					4720	13
5524A	2	12/22/87	01/07/88	01/07/88	Kline Montana Mine Reclamation - Tunnel Entrance (Field #30)	4000 psi	3	N/T	3550	16
5524B										
5524C										
5533A	3	12/22/87	01/15/88	01/18/88	Kline Montana Mine Reclamation - Tunnel Entrance (Field #22)	4000 psi	3	N/T	5130	27
5533B										
5534A	4	12/22/87	01/15/88	01/18/88	Kline Montana Mine Reclamation - Tunnel Entrance (Field #30)	4000 psi	3	N/T	4900	27

Cylinders 5500A, 5500B, 5524A, 5533A and 5534A were field cured only.
Field Test Performed By Client.

HKM ASSOCIATES

BY: Randy Fink

HKM ASSOCIATES

SUMMARY OF CONCRETE TEST DATA

PROJECT NAME: Quality Concrete - 1988 Materials Testing
PROJECT NO: 11C146.102
Document NO: WPLAB37

REPORT DATE: Various
CONTRACTOR: Quality Concrete
SUPPLIER: Quality Concrete

Cylinder No.	Rpt No.	Dates			Sample Location and Structure	Mix No.	Test Results			
		Cast	Recvd	Tested			Slump in.	Air %	Load PSI	Age days
5500A	1	12/22/87	12/30/87	12/31/87	Kline Montana Mine Reclamation - Tunnel Entrance (Field #22)	4000 psi	3	N/T	3220	9
5500B				12/31/87					3360	9
5500C				01/04/88					4720	13

HKM ASSOCIATES

BY:

Field Test Performed by Client.
Cylinders 5500A and 5500B were field cured only.

2-9-88

POST TENSION SLAB-ON-GROUND

Job Name: Klein Mine Shaft Cap

Date: JAN. 28-88

Signature of Stessing Operator: James M Archer & B.T.S.

FOR SLAB-ON-GROUND APLICATIONS GAGE FORCE MUST COMPARE WITHIN 10% OF FORCE INDICATED BY TENDON ELONGATION PTI 4.3.7

FOR STRUCTURES GAGE FORCE MUST COMPARE WITHIN 5% OF FORCE INDICATED BY TENDON ELONGATION PTI 6.3.4

SEATING LOSS APROX. .125IN. JACK LENGTH WITH HYD. NOSE=31IN

P=PRESTRESS DESIGN FORCE LBS	28,900	
A= AREA OF TENDON IN.SQ.	.158	(.153 NORM)
L= LENGTH IN INCHES	257	ELONGATION=PL/E
E= MODULUS IN PSI	28,500,000	

X TENDONS NUMBERED #1 THEN MOVING ________ TO #10 X TENDONS LENGTH____

Y TENDONS NUMBERED #1 THEN MOVING WEST TO #13 Y TENDONS LENGTH 257"

TENDON #	TENDON LENGTH	TOTAL ELONGATION	SEATED ELONGATION	GAGE PRESSURE PSI
Y-COMPUTED	257	1.989	1.775	4,750
ACTUAL			OK ± 2%	
Y1		$-\frac{1}{32}$		✓
Y2				✓
Y3				✓
Y4				✓
Y5				✓ +25
Y6				
Y7				
Y8				
Y9				
Y10				
Y11				
Y12				✓
Y13				

2-9-88

POST TENSION SLAB-ON-GROUND

Job Name: Klein Mine Shaft Cap

Date: JAN. 28-88

Signature of Stessing Operator: James M Archer & B.T.S.

FOR SLAB-ON-GROUND APLICATIONS GAGE FORCE MUST COMPARE WITHIN 10% OF FORCE INDICATED BY TENDON ELONGATION PTI 4.3.7

FOR STRUCTURES GAGE FORCE MUST COMPARE WITHIN 5% OF FORCE INDICATED BY TENDON ELONGATION PTI 6.3.4

SEATING LOSS APROX. .125IN. JACK LENGTH WITH HYD. NOSE=31IN

P=PRESTRESS DESIGN FORCE LBS 28,900
A= AREA OF TENDON IN.SQ. .158 (.153 NORM)
L= LENGTH IN INCHES 293 ELONGATION=PL/E
E= MODULUS IN PSI 28,500,000

X TENDONS NUMBERED #1 THEN MOVING NORTH TO #10 X TENDONS LENGTH 293"

Y TENDONS NUMBERED #1 THEN MOVING ______ TO #13 Y TENDONS LENGTH____

TENDON #	TENDON LENGTH	TOTAL ELONGATION	SEATED ELONGATION	GAGE PRESSURE PSI
X-COMPUTED	293	2.216	2.004	4,700
ACTUAL			ok ± 2%	
X1		$-\frac{1}{32}$		✓
X2		✓		✓
X3		$-\frac{1}{32}$		✓
X4		$-\frac{1}{32}+$		✓
X5		$-\frac{1}{32}$		✓
X6		$-\frac{1}{32}$		✓
X7		✓		✓
X8		$+\frac{1}{32}-$		+50
X9		✓		✓ +25
X10		✓		✓